

EVALUATION THE INTERACTION BETWEEN SOME MEDICINAL PLANTS AND THEIR ASSOCIATED ENDOPHYTIC MICROORGANISMS

By

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B.Sc. Agric. Sc. (Agric. Microbiology), Ain Shams Univ., 2009

M.Sc. Agric. Sc. (Agric. Microbiology), Ain Shams Univ., 2015

**A Thesis Submitted in Partial Fulfillment
Of
The requirements for the Degree of**

**DOCTOR OF PHILOSOPHY
in
Agricultural Sciences
(Agricultural Microbiology)**

**Department of Agricultural Microbiology
Faculty of Agriculture
Ain Shams University**

2020

Approval Sheet

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ABSTRACT

Eman Adel Sayed Ahmed: Evaluation the Interaction between some Medicinal Plants and their Associated Endophytic Microorganisms. Unpublished Ph.D. thesis, Department of Agric. Microbiology, Faculty of Agriculture, Ain Shams University, 2020.

A total of 89 endophytic bacterial cultures were isolated by two techniques from seven medicinal plants; *Coriandrum sativum*, *Anethum graveolens*, *Pelargonium graveolens*, *Ocimum basilicum*, *Rosmarinus officinalis*, *Salvia officinalis* and *Origanum majorana*. To address the biological activity of these isolates as endophytic bacteria, preliminary screening showed 44, 36, 28, 22, 82 isolates out of total one (89 isolates) gave positive results for cellulase, pectinase, amylase activities, indole acetic acid (IAA) and gibberellic acid (GA₃) production, respectively. In the secondary screening twenty endophytic bacterial isolates were selected and examined for their antagonistic effect against four phytopathogenic fungi, antioxidants activity, total phenols, indole acetic acid, ammonia (NH₃), siderophores production and nitrogenase activity. According to the last screening; six isolates were chosen because of their multi-plant growth promoting (PGP) traits. They recorded a wide range of total flavonoids concentration in endophytic bacterial supernatant. The values of total flavonoids varied from 1.43 to 31.14 ppm. While the alkaloids production was detected by all tested isolates except isolate S14. Isolate B3 gave the maximum alkaloids concentration in its supernatant being 0.34 ppm. Four isolates are able to solubilize phosphate with low variations between them in soluble phosphate that ranged from 3.85 ppm by isolate C8 to 5.65 ppm by isolate RO14. All isolates showed negative result for hydrogen cyanide (HCN) production. The colonization of the tested isolates (6 isolates) inside the tissue of two medicinal plant was detected using; 2,3,5-triphenyl tetrazolium chloride (TTC) stain and transmission electron microscope (TEM). Based on some morphological and biochemical characteristics of the most efficient isolates; RO10,

RO14, S14, D6, C8 and B3 were assigned to three genera (*Enterobacter* sp., *Aeromonas* sp. and *Bacillus* sp.). Hypersensitivity test proved that all the six endophytic bacterial isolates are nonpathogenic bacteria. Where, these isolates gave negative symptoms of hypersensitivity reaction (HR) test on the pepper plants (*Capsicum annuum*) used as indicator plant. Six bacterial isolates with multiple plant beneficial traits were chosen to evaluate their abilities to induce systemic resistance of basil plant grown in infested soil to *Fusarium oxysporium* B27. The bacterial treatments gave 100% survival rate against 40% for control treatment. Generally, all the bacterial treatments recorded high capacity of vegetative parameters compared with the control treatment (without bacteria). Higher level of N, P and K uptake of plant were observed with isolate S14, RO10 and D6 in presence of pathogenic fungi. Additionally, there was varied capacity of different bioactive compound in basil leaves, there was a significant effect between bacterial treatments and control treatments (without bacteria) for phenols, flavonoids, antioxidant activity and defense enzymes. As a result to induced systemic resistance experiment; the three potent isolates (S14, D6 and RO10), which display a good effect as endophytic bacteria on basil plant were chosen for molecular identification using 16s rRNA gene sequence. The identified strains were examined to study their performance on basil and coriander plants as a mixed culture. In basil plants survival rate reached 80% against 20% for infested plants, while coriander plants showed 90% survival against 10% for infested plants. The vegetative parameters were significantly increased with mixed culture. Also, positive effect was observed with bacterial treatments on NPK uptake, redox compounds and defense enzymes of basil and coriander plants compared to un-inoculated treatment.

Key Words: Endophytic bacteria, Medicinal plants, TEM, Plant Growth promoting Endophytic (PGPE), Endophytic colonization, basil, coriander, Antioxidant activity, phenols, flavonoids, Extracellular enzymes, enzymes activity.

ACKNOWLEDGEMENT

Praise and thanks to ALLAH, the most merciful for assisting and directing me to the right way

There are few opportunities in most people's lives to demonstrate formally one's gratitude to people who have been mentors and supporters at different steps of our lives. Even though, we do not forget to stamp those feelings on paper.

Deep thanks and appreciation are extended to **Dr. Elshahat Mohamed Ramadan** Prof. Emeritus of Agricultural Microbiology, Department of Agricultural Microbiology, Faculty of Agriculture, Ain Shams University for his support and valuable supervision throughout this study.

I would like to express my sincere thanks, and deep gratitude to **Dr. Enas Abd El- Tawab Hassan** Prof. of Agricultural Microbiology, Department of Agricultural Microbiology, Faculty of Agriculture, Ain Shams University for her fruitful discussion, criticism and valuable help throughout of this study.

I would like to thank **Dr. Kareem Moustafa Kamal El- Tobgy** Senior Researcher of Medicinal and Aromatic plants chemistry, Director of Central lab., Horticulture Research Institute, Agriculture Research Center for his support and faithful assistance throughout this study.

Finally, deep gratitude is to all my family and my friends for their continuous help and encouragement throughout this work.

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